

What Is Claimed:

1. A satellite network comprising:  
  
inter-satellite links;  
  
backbone satellites configured to act as routers for data units transmitted through the network, the backbone satellites communicating with one another through the inter-satellite links;  
  
access links;  
  
user satellites configured to connect with the network via the backbone satellites through the access links;  
  
up/down links; and  
  
ground stations configured to connect to the backbone satellites through the up/down links,  
  
wherein the inter-satellite links and the up/down links include directional transmissions from the user satellites and the access links include omni-directional transmissions from the user satellites.
2. The satellite network of claim 1, wherein at least two of the ground stations are coupled through terrestrial links.
3. The satellite network of claim 1, wherein the backbone satellites, user satellites, and ground stations communicate with one another using the Internet Protocol (IP).

4. The satellite network of claim 1, wherein the backbone satellites each further comprise:

a plurality of input/output devices that form the inter-satellite links, up/down links, and access links.

5. The satellite network of claim 1, wherein the backbone satellites dynamically form and break connections with one another based on relative locations of the backbone satellites to one another.

6. The satellite network of claim 1, wherein orbits of the backbone satellites include at least one of the backbone satellites in multiple ones of geostationary orbits, medium earth orbits, low earth orbits, highly inclined orbits, eccentric orbits, or Moliya orbits.

7. The satellite network of claim 1, wherein each of the backbone satellites further comprises:

a forwarding engine;

a processor coupled to the forwarding engine; and

a random access memory coupled to the processor and the forwarding engine.

8. The satellite network of claim 7, wherein each of the backbone satellites further includes:

a plurality of input/output devices that form the inter-satellite links, up/down links, and access links.

9. The satellite network of claim 7, wherein at least one of the backbone satellites further comprises redundant implementations of the forwarding engine, the processor, and the random access memory.

10. A method of adding a satellite into a satellite network, the method comprising:

- determining, at the satellite, an orbital location of the satellite;
- selecting a ground station with which to communicate based on the determined orbital location;
- receiving, from the selected ground station, at least one of location and orbital information of other satellites in the satellite network; and
- transmitting the location of the satellite to the selected ground station.

11. The method of claim 10, wherein selecting the ground station is based on a prestored list of ground stations and locations corresponding to the ground stations.

12. The method of claim 10, further comprising:

- creating inter-satellites links with other satellites in the satellite network.

13. The method of claim 12, further comprising:

dynamically modifying the inter-satellite links based on changing orbital information of the satellite and the other satellites.

14. The method of claim 12, wherein the inter-satellite links are formed with directional receivers and transmitters.

15. The method of claim 12, wherein the inter-satellite links are formed between satellites in different orbits.

16. The method of claim 15, wherein the different orbits include at least two of geostationary orbits, medium earth orbits, low earth orbits, highly inclined orbits, eccentric orbits, or Moliya orbits.

17. The method of claim 12, wherein the satellite and the other satellites communicate over the inter-satellite links based on the Internet Protocol (IP).

18. A satellite comprising:  
a router;  
omni-directional radio frequency links;  
a first input/output device configured to communicate with other devices using the omni-directional radio frequency links;  
directional communication links; and

a second input/output device configured to communicate with other satellites using the directional communication links which are higher capacity links than the omnidirectional radio frequency links.

19. The satellite of claim 18, further comprising:

a third input/output device configured to communicate with ground stations using directional communication links.

20. The satellite of claim 18, wherein the router further comprises:

a processor,

a memory, and

a forwarding engine.

21. The satellite of claim 18, wherein the second input/output device forms a laser communication link.

22. The satellite of claim 18, wherein the second input/output device forms a radio frequency communication link.

23. A method of operating a satellite network including backbone satellites and user satellites, the method comprising:

receiving position information from the backbone satellites;

calculating network topology information based on the position information; and

creating inter-satellite links, via directional transmitters/receivers, between the backbone satellites based on the network topology information; and

communicating packet data through the satellite network over the inter-satellite links.

24. The method of claim 23, wherein the position information includes orbital information of the backbone satellites.

25. The method of claim 23, wherein the position information includes location information of the backbone satellites.

26. The method of claim 25, further comprising:

creating access links, via omni-directional transmitters/receivers, between the backbone satellites and the user satellites.

27. The method of claim 26, further comprising:

creating up/down links between the backbone satellites and ground stations.

28. A satellite comprising:

means for determining an orbital location of the satellite;

means for selecting a ground station with which to communicate based on the determined orbital location;

means for receiving at least one of location and orbital information of other  
satellites in the satellite network; and

means for transmitting the location of the satellite to the selected ground station.